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A STUDY TO ASSESS THE PHYSICAL THERAPY BASED ON CLOSED KINEMATIC CHAIN PATTERNS FOR PATIENTS AFTER TOTAL HIP REPLACEMENT

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INTRODUCTION

In a total hip replacement (also called total hip arthroplasty), the damaged bone and cartilage is removed and replaced with prosthetic components. The damaged femoral head is removed and replaced with a metal stem that is placed into the hollow center of the femur. The femoral stem may be either cemented or "press fit" into the bone. A metal or ceramic ball is placed on the upper part of the stem. This ball replaces the damaged femoral head that was removed. The damaged cartilage surface of the socket (acetabulum) is removed and replaced with a metal socket. Screws or cement are sometimes used to hold the socket in place.

A plastic, ceramic, or metal spacer is inserted between the new ball and the socket to allow for a smooth gliding surface.

Definition

A total hip replacement is a surgical procedure where the diseased cartilage and bone of the hip joint is surgically replaced with artificial materials. Total hip joint replacement involves surgical removal of the diseased ball and socket and replacing them with a metal (or ceramic) ball and stem inserted into the femur bone and an artificial plastic (or ceramic) cup socket.

EPIDEMIOLOGY, PREVALENCE

- Osteoarthritis is the commonest cause of disability in older people (Martin J et al ,1988).
- Prevalence figures for hip osteoarthritis range from 7–25% in people aged over fifty five (Dougados M, 1996) with over 70% of sufferers experience pain and limitations in performing activities of daily living, such as mobility outside the home (Fautrel B et al, 2005).
- Effective treatment exists for end-stage disease in the form of joint arthroplasty (Birrell F et al,2000).
- The number of primary total hip replacements procedures for osteoarthritis continues to rise steadily with 51,981 procedures reported for England and Wales in 2006 (National Joint Registry for England and Wales, 2008).

- For patients without incapacitating systemic or life-threatening disease the average length of stay in hospital between 2003–2006 was 7.4–8.9 days in England and Wales (National Audit Office, 2003).

ANATOMY, PHYSIOLOGY AND BIOMECHANICS

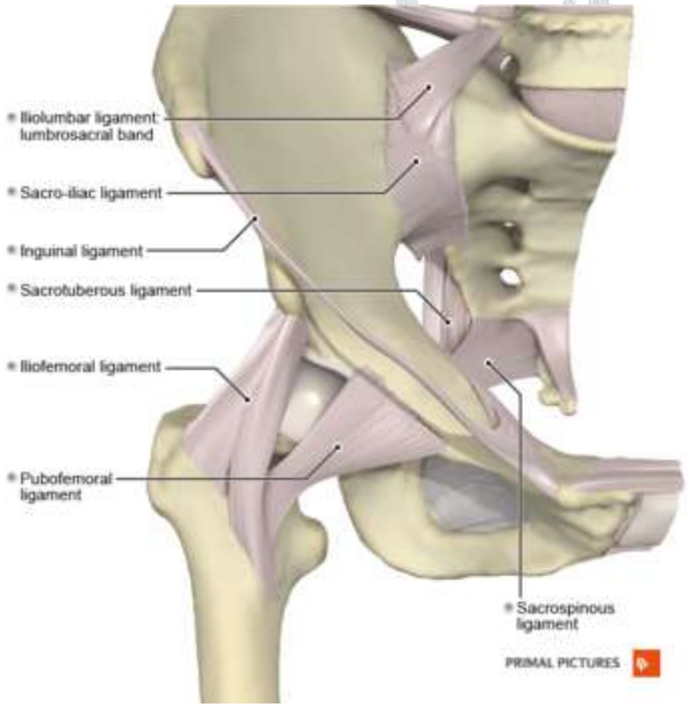
Total hip arthroplasty (THA) is one of the most cost-effective and consistently successful surgeries performed in orthopedics.

• THA provides reliable outcomes for patients' suffering from end-stage degenerative hip osteoarthritis (OA), specifically pain relief, functional restoration, and overall improved quality of life(Gold M, 2020). Once considered a procedure limited to the elderly, low-demand patients, THA is becoming an increasingly popular procedure performed in patenting patient populations(Levangie P,2005).

• During a hip replacement, the head of the femur is replaced with a prosthetic head on a shaft, and the joint surface of the acetabulum is lined with a bowl-shaped synthetic joint surface.

• A partial hip replacement can also be done for neck of femur fractures (mostly displaced)(Groh MM, 2009) where only the femoral part is replaced.

Figure 1: Hip prosthesis zones according to DeLee and Charnley, and Gruen. These are used to describe the location of eg areas of loosening.



CLINICALLY RELEVANT ANATOMY

The hip is a ball and socket joint. This design allows the poly-axial movement seen at the hip.

1. The ball is the femoral head. The head of the femur is gripped by the acetabulum beyond its maximum diameter.
2. The acetabulum (part of the pelvis) is the socket. The acetabulum is cup-shaped, providing the articular surface for the head of the femur to move within.

The head of the femur and the inside of the acetabulum are covered with a layer of hyaline cartilage(Lewis CL, 2008). Once this cartilage is worn away or damaged (usually by arthritis), the underlying bone is exposed, resulting in pain, stiffness and possibly shortening of the affected leg. By replacing these surfaces, the aim is to reduce pain and stiffness to restore an active and pain-free life.

CAUSES &/ OR RISK FACTOR, RELEVANT

- limitation of hip movement in accordance with Cyriax jointcapsular pattern. Hip flexion becomes restricted but this movement remains the most flexible for the longest time; later hip flexion and adduction contracture appears,
- pain located in the area of hip joint, major trochanter and groin. It can radiate to the knee or lumbar spine; pain is increased after prolonged exercise but sometimes even a small effort produces a very severe pain,
- locomotor's dysfunction and adopting the static positionsthat lessen the load on the hip joint (Kokosz M,2004; Kirkesola G.,2002, Plaatsman G, 1998; Lephart S.(eds)., 2000 and Dega W,1996).

PATHOPHYSIOLOGY /MODE OF MECHANISM OF INJURY

After surgery it is essential to restore lost hip function therefore a suitable rehabilitation program is required. The aim of physiotherapy is to prevent soft tissues (muscles, ligaments, joint capsule) from contracting and getting shorter, to restore range of motion, proper mass and strength of the muscles and to reeducate walking patterns. This treatment will allow patients to carry out normal activities of daily living (Dega W, 1996; Garlicki M, 1998; Siwek W, 2001 and Zembaty A. 2002).

CLINICAL MANIFESTATIONS

- These symptoms significantly influence on patients' daily functioning, make them reduce physical and professional activity and social contacts.
- It affects the mental and emotional state of patients and therefore, the quality of life is worse (Nowotny J. 2006 and Giemza Cz, 2010).
- Advanced osteoarthritis usually requires surgical treatment which consists in replacing the damaged joint by prosthesis.
- The main aim of endoprosthesis implantation is to improve the biomechanical conditions of the joint and reduce pain(Skolimowska B, 2005 and Czerwiński E, 2001).

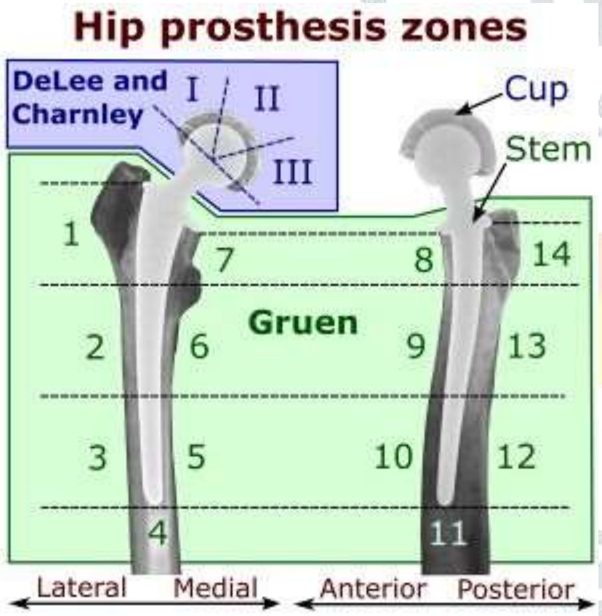
RELEVANT INVESTIGATION

An evaluation with an orthopedic surgeon consists of several components.

- **Medical history.** Orthopedic surgeon will gather information about general health and ask questions about the extent of hip pain and how it affects ability to perform everyday activities.
- **Physical examination.** This will assess hip mobility, strength, and alignment. (https://orthoinfo.aaos.org/en/treatment/)
- **X-rays.** These images help to determine the extent of damage or deformity in hip.
- **Other tests.** Occasionally other tests, such as a magnetic resonance imaging (MRI) scan, may be needed to determine the condition of the bone and soft tissues of hip.

DIFFERENTIAL DIAGNOSIS

- To be considered for a total hip replacement, most individuals will have already been seen by a medical professional. physician will order x-rays to assess whether there are changes to the bones and cartilage of hip.
- If patient have had a fall, x-rays will also guide the attending health care professionals in determining if there is a fracture and if it requires surgery in order for patient to regain function.
- A physical therapist will evaluate range of motion, strength, and how much hip pain impacts functional mobility.
- Factors can include how patient get in and out of bed, sit down and stand up, squat down, walk, and navigate stairs and curbs. The results of these evaluations will help determine whether patient might benefit from total hip replacement surgery.



Total hip replacement is a frequently done procedure. (Narvani AA,2003 and Lovell G. 1995)

- Mostly done electively
- Used to in the management of hip fractures (mostly displaced neck of femur fractures) caused by trauma (e.g. fall) or pathological processes. Osteoporosis and osteomalacia are significant factors responsible for the high incidence of hip fractures within the elderly population.
- Due to the high degree of success at reinstating independence and mobility of osteoarthritis sufferers, total hip replacement procedures have become a well-accepted treatment modality for hip degeneration secondary to osteoarthritis. (Narvani AA,2003; Lovell G. 1995; Crawford MJ, 2007; Byrd JT., 1996 and Martin RL, 2006)
- Also a treatment for juvenile rheumatoid arthritis but only if all the other options have failed. (Martin RL,2006)

THR X-ray

Indications for Surgery

The most common indication for THA includes end-stage, symptomatic hip OA. In addition, hip (osteonecrosis) ON, congenital hip disorders including hip dysplasia, and inflammatory arthritic conditions are not uncommon reasons for performing THA. Hip ON, on average, presents in the patientnger patient population (35 to 50 years of age) and accounts for approximately 10% of annual THAs. Some common indications include (OG Anatomy., 2020):

- Osteoarthritis (see Figure 4)
- Post-traumatic arthritis
- Rheumatoid arthritis including juvenile rheumatoid arthritis
- Avascular necrosis
- Hardware failure after internal fixation of hip fractures
- Congenital hip dislocations and dysplasia

Contraindications for Surgery

THA is contraindicated in the following clinical scenarios:

- Local: Hip infection or sepsis
- Remote (i.e. extra-articulararticular) active, ongoing infection or bacteremia
- Severe cases of vascular dysfunction(Varacallo M, 2020)

MEDICAL &/ OR SURGICAL INTERVENTIONS

- Hip replacement surgery can be performed traditionally or by using what is considered a minimally-invasive technique. The main difference between the two procedures is the size of the incision.
- During standard hip replacement surgery, patient are given general anesthesia to relax muscles and put patient into a temporary deep sleep. This will prevent patient from feeling any pain during the surgery or have any awareness of the procedure. A spinal anesthetic may be given to help prevent pain as an alternative.
- The doctor will then make a cut along the side of the hip and move the muscles connected to the top of the thighbone to expose the hip joint. Next, the ball portion of the joint is removed by cutting the thighbone with a saw. Then an artificial joint is attached to the thighbone using either cement or a special material that allows the remaining bone to attach to the new joint Hip replacements surgery has been performed for years and surgical techniques are being improved all the time. As with any surgery, however, there are risks. Since patient will not be able to move around much at first, blood clots are a particular concern. doctor will give patient blood thinners to help prevent blood clots from occurring. Infection and bleeding are also possible, as are risks associated with using general anesthesia.(David Zelman, 2020)

OBJECTIVES OF THE STUDY

- To find out the effectiveness of physiotherapy management after surgery in Total Hip Replacement.

- To find out the effectiveness of conventional physiotherapy in the management of pain among the Total Hip Replacement patients

METHODOLOGY

Thirty patients of the Department of Orthopedics and Traumatology of selected Hospital, Patna. In order to be included in the study the patients had to meet the following criteria: they had not undergone any endoprosthesis or lower extremities surgery in the past and they were not diagnosed with any mental illness or neurological disorder of central or peripheral nervous system.

"Only" 30 patients who had undergone total hip joint replacement in Hospital met these criteria. Collecting data for this study took 12 months.

The CKC group (CKC=closed kinetic chain)

The CKC group consisting of 15 patients (7 men and 8 women) of the Department of Orthopedics and Traumatology of SMN Přerov went through postoperative rehabilitation according to the Acral Coactivation Therapy principles. The average age of the patients was 59 ± 13.9 years.

The OKC group (OKC=open kinetic chain)

Also the OKC group included 15 patients (8 men and 7 women) of the Department of Orthopedics and Traumatology of SMN Přerov who underwent postoperative therapy, which is based mostly on open kinetic chain exercises, according to the standard procedures of SMN Přerov. The average age of the patients was 58 ± 9.7 years.

The probands were divided into individual groups by means of adaptive randomization. At the beginning of the study both groups of the patients did not differ considerably in terms of the observed parameters (Table 1). At-entry differences of the observed groups did not show any statistical significance.

Table 1. Entry parameters.

	CKC group (μ)	P	OKC group (μ)
Age	59	SID	58
B.E.S.S.	5.3	SID	5.3
FT	36.1	SID	35.5
HHS	48.1	SID	52.8

The CKC group therapy

The CKC group therapy followed the basic principles of the Acral Coactivation Therapy. The rehabilitation plan consisted of (on average) six 30-min workout units under the guidance of a qualified physiotherapist who supervised quality of the carried out motor patterns. The therapy itself began the second postoperative day and continued until the patients were discharged and took part in subsequent rehabilitation treatment.

The managed therapy took place only during working hours of the physiotherapist (i.e. working days). In order to improve quality the patients got an aid: Functional Hand Arch Support (only for the purpose of the managed therapy). These gloves, specially tailored for the ACT method, maintain optimum setting of arches of the hand.

Outside the time set aside for the therapy (i.e. at weekends, in free time) the probands carried out autotherapy according to the ACT without the physiotherapist's intervention. For these purposes the patients got the publication of The Acral Press Up Exercises for Straightened Spine where the ACT positions used in the therapy were marked. First, the patients carried out all the safe exercises in the managed therapy conducted under the guidance of a physiotherapist to avoid wrong fixation of motor patterns and subsequent errors in autotherapy. The therapy took place in SMN Přerov in the gym of the department of orthopedics and traumatology.

STATISCAL ANALYSIS

EVALUATION OF POSTURAL STABILITY

Evaluation of postural stability by means of MobileMat™ Programme

Postural stability and reactivity was evaluated by means of a force plate by Tekscan using the MobileMat™ programme. This programme works on the Balance Error Scoring System (B.E.S.S.) principle developed by researchers Guskiewitz, Riemann and Shields.

MobileMat™ programme was developed mainly in order to improve the accuracy of B.E.S.S. evaluation, which can be influenced by a human factor, i.e. subjective inputs of a testee. It is a computer-based evaluation of B.E.S.S.

The studies show that the MobileMat™ programme can run a more precise analysis of B.E.S.S., in particular lifting a part of the foot off the force plate, lifting an arm from the base position or changing the position of a non-weight bearing hip (i.e. when standing only on the other leg). However, MobileMat™ programme cannot evaluate if the testee closes their eyes. In this case, this factor is supervised by a qualified physiotherapist [17, 18, 19].

Evaluation of postural stability took place in a calm environment of the department of orthopedics and traumatology in the gym of SMN Přerov. The measurement included three positions that were repeated three times by the probands. With regard to early postoperative stage alternative positions were chosen (see below) which could be carried out by the patients without being exposed to dangerous positions or inadequate physical load of the operated leg. The patients held each position for 20 seconds and had their eyes closed during the whole measurement.

3.8.1.1. Selected positions

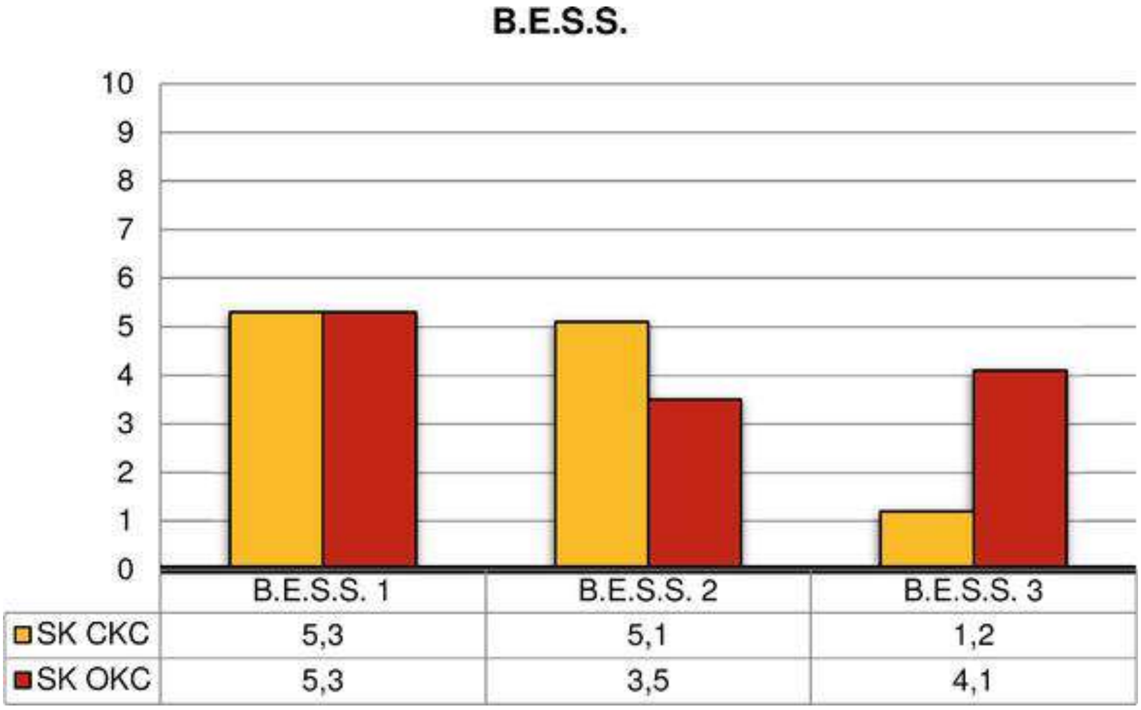
1. Standing with feet hip-width apart on both feet; the entire feet are in touch with the Tekscan force plate; standing straight with the hands on the hips.
2. Standing on both lower extremities, in tandem left forward position; the entire feet are in touch with the Tekscan force plate; standing straight with the hands on the hips.
3. Standing on both lower extremities, in tandem right forward position; the entire feet are in touch with the Tekscan force plate; standing straight with the hands on the hips.

Two physiotherapists made measurement while one of them operated the computer and the other one supervised correct posture of the probands in the selected positions. Due to personnel reasons the persons who were not familiar with classification of the probands into the test groups could not make measurement. Evaluation was carried out properly without any intervention leading to distorting results. Measurement was performed 1 day before surgery, the fourth postoperative day and finally on the tenth postoperative day (i.e. the last day of the managed rehabilitation). During evaluation of postural stability the measured values of the individual positions were counted up and the arithmetic mean was calculated.

Both groups had the same average values, i.e. 5.3 postural errors, during entry measurement. In the postoperative stage the CKC group showed 5.1 errors per patient, while the OKC group had 3.5 errors on average. The measured values were entered in a table (see Table 2). Graph 1 shows the differences in the reached B.E.S.S. values of the observed groups.

	CKC group (μ)	P	OKC group (μ)
B.E.S.S. 1	5.3	SID	5.3
B.E.S.S. 2	5.1	SID	3.5
B.E.S.S. 3	1.2	SSD	4.1

Table 2. B.E.S.S. evaluation.



Graph 1.

Results of the balance error scoring system explanatory notes: B.E.S.S. 1-evaluation of postural errors according to the balance error scoring system in the MobileMat™ programme (preoperative measurement), B.E.S.S. 2-evaluation of postural errors according to the balance error scoring system in the MobileMat™ programme (postoperative measurement), B.E.S.S. 3-evaluation of postural errors according to the balance error scoring system in the MobileMat™ programme (after termination of the managed rehabilitation), SK CKC-the CKC group, SK OKC-the OKC group.

The final measurement showed a significant statistical difference (p = 0.008975) between the entry values of the individual groups. The CKC group reached 1.2 error, while the OCK group had 4.1 errors on average. This difference shows also high effect size (Cohen's d = 0.875). Non-parametric Mann–Whitney U test was used to determine statistical significance of two selected files.

EVALUATION OF THE PATIENT FUNCTIONAL MOVEMENT SKILLS

A day before surgery a qualified physiotherapist evaluated functional skills of the patients according to the Functional Test Questionnaire (see Table 3). This specific questionnaire was developed solely for the purpose of this study. The Functional Test Questionnaire included those movement patterns that the patients used in ADL. Evaluation of functional movement skills consisted in assessment of a manner of execution of the selected movement patterns. Finally, these results were quantified in the questionnaires. The highest achievable score was 50.

Functional skills were evaluated again on the fourth postoperative day in order to visualize the differences between the preoperative and postoperative physical condition of the patients. Exit measurement took place on the tenth postoperative day (i.e. the last day of the managed rehabilitation). The testing was done by one qualified physiotherapist in order to avoid data distortion.

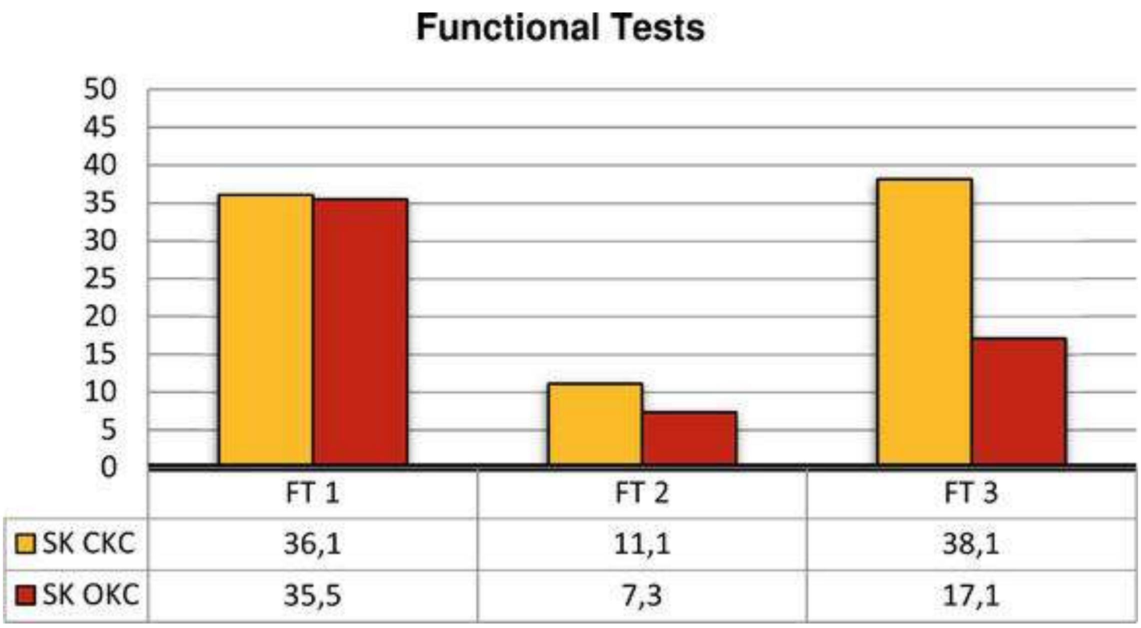
Before surgery the CKC group patients reached 36.1 points on average. The fourth postoperative day the average value of functional skills fell to 11.1 points. However, the patients reached 38.1 points on average within the final measurement. The OKC group showed an average value of 35.5 points of functional skills at the beginning of the research. The average reached value after surgery was 7.3 points. However, the OKC group reached only 17.1 points on average within the final measurement.

RESULT

Table 4 shows results of the individual measurements. In order to visualize the results a graph (see Graph 2) was developed in order to depict changes in the result values of both groups.

Table 4. Evaluation of movement skills (Functional tests).

	CKC group (μ)	P	OKC group (μ)
FT 1	36.1	SID	35.5
FT 2	11.1	SID	7.3
FT 3	38.1	SSD	17.1



Graph 2.: Results of the functional tests explanatory notes: FT 1-functional tests (preoperative measurement), FT 2-functional tests (postoperative measurement), FT 3-functional tests (final measurement after rehabilitation), SK CKC-the CKC group, SK OKC-the OKC group.

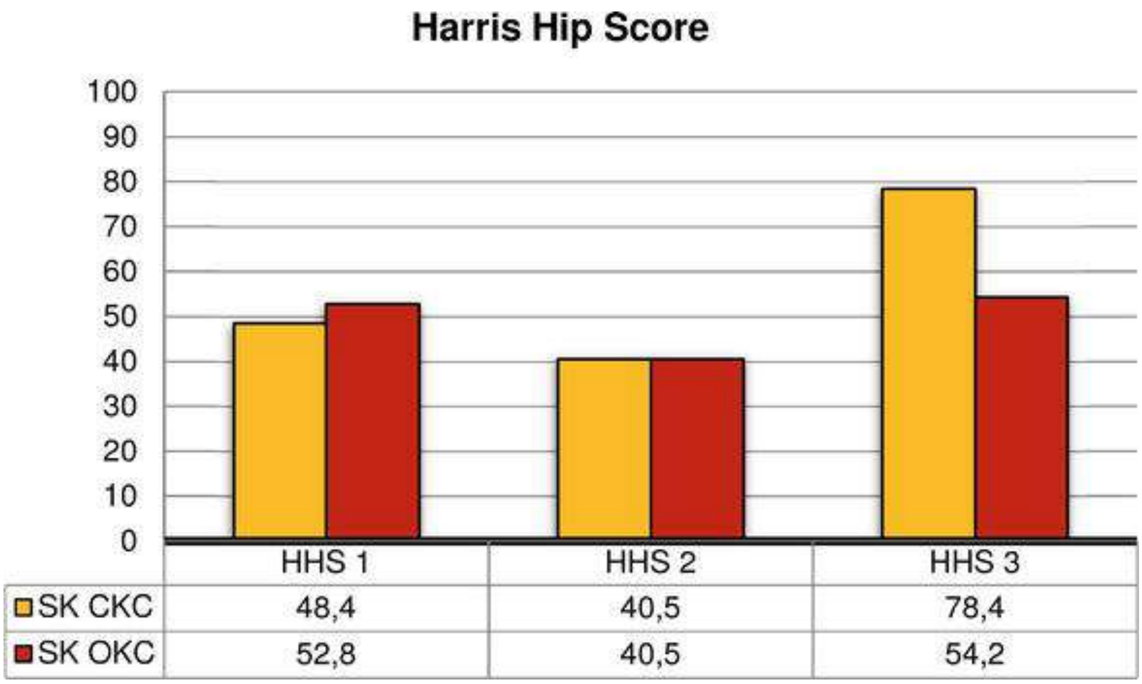
The difference between exit values (i.e. those measured after termination of rehabilitation) of the individual groups was statistically significant ($p = 0.00001$). This result showed also a significant effect size (Cohen's d = 4.04). Non-parametric Mann–Whitney U test was used to determine statistical significance of two selected files.

3.8.3. Objectivization of the closed kinetic chain therapy results based on the Harris hip score

The patients who took part in the study filled in a Harris Hip Score questionnaire before their surgery. This is a specialized questionnaire assessing skills within ADL in patients with hip joint diseases (arthrosis, necrosis of the ball). William H. Harris developed this questionnaire in order to evaluate level of pain and movement skills of patients before and after surgery. For the purpose of our study a modified version of the questionnaire was used, i.e. evaluation of the range of motion of the hip joint. The highest achievable score is 100. If a patient reaches 70 points or less, their physical condition is considered bad. Willim H. Harris considered a surgery successful when the score reached after surgery was at least 20 points higher than before surgery [20, 21, 22, 23, 24].

The patients filled in the Harris Hip Score questionnaire again on the fourth postoperative day in order to visualize the difference between the preoperative and postoperative physical condition. The final evaluation took place on the last day of the managed rehabilitation, i.e. on the tenth postoperative day.

Within the entry measurement of the Harris Hip Score the CKC group reached 48.4 points on average. The OKC group's average score in the questionnaire was 52.8. Both groups reached equal values in the postoperative measurement, i.e. 40.5 points per patient on average. The measured values were entered in a table (see Table 5). Graph 3 shows the differences between the reached values of the individual group.



Graph 3.: Harris hip score results explanatory notes: HHS 1 - Harris hip score (preoperative measurement), HHS 2 - Harris hip score (postoperative measurement), HHS 3 - Harris hip score (final measurement after rehabilitation), SK CKC – The CKC group, SK OKC – The OKC group.

The exit measurement showed a significant statistical difference ($p = 0.00001$), where the CKC group reached 78.4 points and the OKC group 54.2 points on average. This difference showed also a high effect size (Cohen's $d = 3.63$). Non-parametric Mann–Whitney U test was used to determine statistical significance of two selected files.

Study assessing Harris hip score results

The Harris Hip Score questionnaire has been used in the department of orthopedics and traumatology of SMN Přerov since the beginning of 2015 and it replaced the Staffel Score questionnaire used formerly, which is not globally recognized and is less specific in terms of evaluation activities of daily living.

On the grounds of the two-year research efficacy of the therapy based on the ACT principles, i.e. therapy in a closed kinetic chain, was assessed. In order to get long-term results the time during which the patients filled in the questionnaire was modified.

The first time the patients filled in the questionnaires was standard, i.e. 1 day before surgery, next after termination of the managed rehabilitation in the department of orthopedics and traumatology of SMN Přerov (6 therapies on average) and the last time was 4 months after hip joint replacement, i.e. within a regular orthopedic check-up. The patients were observed from the beginning of 2015 until the end of 2016. During this period 168 patients who underwent total hip joint replacement went through the therapy based on the ACT principles. The measured values were entered into a table (see Table 6). Before surgery the patients had 43.3 points of Harris Hip Score, after termination of the managed rehabilitation they reached 74.3 points on average. After leaving the department of orthopedics and traumatology of SMN Přerov the patients started subsequent rehabilitation treatment, they followed up the existing therapy and went on improving their functional and conditional skills. Within the regular orthopedic check-up, i.e. during the fourth month after surgery, the patients reached on average 94 points in the Harris Hip Score questionnaire.

Table 5.: Harris Hip Score values.

	CKC group (μ)	P	OKC group (μ)
HHS 1	48.4	SID	52.8
HHS 2	40.5	SID	40.5
HHS 3	78.4	SSD	54.2

Table 6.: Harris Hip Score results of two-year observation.

	168 CKC group patients (μ)
HHS 1	43.3
HHS 2	74.3
HHS 3	94

The benefit of the therapy applied in a CKC consists mainly in relatively easy performance and understanding of exercises which can be modified according to the skills and needs of an individual. The therapy based on the ACT principles helps to reduce subjective perception of pain and to improve motor skills in patients. Patient satisfaction with surgery depends on improvement of the quality of their life, i.e. on reduction or elimination of pain and renewal of motor skills they could do with a healthy hip joint [25, 26, 27, 28, 29].

DISCUSSION

This study deals with movement therapy management in patients after total hip joint replacement (THR). Primarily it is about setting movement patterns which are the most beneficial for patients in terms of postural reactivity, next about reducing subjective perception of pain, renewing functional abilities from the perspective of activities of daily living (ADL) and last but not least about satisfaction with surgery.

Degenerative changes of weight-bearing joints rank, without hesitation, among diseases of civilization of the musculoskeletal system. In the final stage of this disease the patients are significantly limited, in particular their movement abilities in ADL, and they suffer from strong pain which is frequently alleviated by pharmaceutical drugs. In the final stage total replacement of the afflicted joint, a hip joint in this case, is indicated in the patients. There is no doubt that postoperative care of the patients is a multi-branch matter and that rehabilitation managed by a qualified physiotherapist is its integral part [1, 2].

In total hip replacement the joint capsule is damaged, which results in the reduction of statesthetic and kinetic proprioception and aggravation of postural stability mainly in vertical positions and deterioration of locomotion skills. Postoperative recovery is accompanied by other problematic factors, e.g. pain caused by the surgical intervention itself or limited mobility of the operated limb due to anti-luxation regime. All the named factors reflect on the patient's final movement expression.

The aim of the managed postoperative rehabilitation should be not only motor recovery of the operated lower limb but also setting stereotyped physiological movement concerning ADL. The selected movement patterns, which the patient performs within the therapy, should reflect on their daily performance. The therapy should not lack a principle of similarity, i.e. the patients are provided with such movement patterns that can be integrated in activities of daily living.

Many authors consider learning and mastering closed kinetic chain (CKC) activities as a factor indispensable for carrying out physiological movements in an open kinetic chain (OKC). It means that the therapy itself should always start in a position which is relatively easy for muscle chains activation, i.e. applying pressure. Closed kinetic chain movements optimize activity of the engaged muscle groups which besides other things helps reduce subjective pain perception [3, 4, 5, 6, 7].

For the purposes of our study we chose the Acral Coactivation Therapy (ACT) that meets all the above mentioned criteria for the management of high quality rehabilitation of the patients after total hip joint replacement.

CONCLUSION

In conclusion, insufficient evidence currently exists to establish the effectiveness of physiotherapy exercise following primary hip replacement for osteoarthritis. Further well-designed trials are required to determine the value of post discharge exercise following this common surgical procedure.

This study also aims at pointing out that minimum objectivization means are used in the branch of rehabilitation, which results in interpretation of movement therapy as an empirical branch lacking objective values. The patients´ subjective feedback concerning evaluation of therapy results is certainly important, however, efficacy of therapy cannot be objectively assessed without recorded data. For this reason we chose a measurement system of a force plate by Tekscan or specific questionnaires tailor-made for patients with a given diagnosis in order to make the results objective.The results of this study show that the managed rehabilitation in a closed kinetic chain has demonstrably better results compared to the therapy conducted in an open kinetic chain. The similarity principle, which integrates functional movement patterns into patients´ activities of daily living, is considered the key element. The patients agree that if the movement therapy is aimed at improvement of specific motion skills applicable in ADL, their motivation to perform the exercises is higher. Correctly set up CKC therapy leads to reduction of subjective perception of pain, which has already been proved in various studies. The results of our study show not only significant improvement of functional skills of patients in ADL but also significant reduction of a number of postural errors concerning standing positions and locomotion.

Patients undergo total hip joint replacement in particular in order to improve the quality of their life. On the grounds of our study's results it can be stated that the ACT based therapy, compared with the open kinetic chain therapy, influences the quality of the patients´ life after total hip joint replacement in a significant way

SUMMARY

The study will focus on the importance of properly managed movement therapy for patients after total hip replacement. It is necessary to find correct movement patterns which can help patient to become more independent in ADL and locomotion. It seems to be much more effective to choose therapy based on closed kinematic chains (CKC). In CKC we have bigger amount of motor units and it is easier to maintain postural reactivity. The main aim is to use similarity in movement patterns. In therapy we choose patterns that are similar to ADL activities. Acral Coactivation Therapy (ACT) is a movement therapy that works with these principles. The effects of the therapy are seen in different areas: improvement of patient's ADL skills, better postural reactivity and stability (lumbo-pelvic stability), decrease subjective level of pain. In the subacute and chronic phase of therapy, we can follow up previous aims and focus on restoring full function and condition.

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